REMARKS

Reconsideration of this application, as amended, is respectfully requested.

Firstly, the Applicants express gratitude for the indication that claims 6, 11 and 13-15 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Accordingly, claims 6, 11 and 13 have been amended in independent form and, therefore, claims 6, 11, and 13-15 are now allowable. Secondly, minor typographical errors have been corrected in the specification and in claims 1, 15, and 16. These amendments were not made for any reasons of patentability.

In the Office Action, the Examiner rejected claims 1-5, 9, 10 and 12 under 35 U.S.C. § 103 as being unpatentable over Ogawa in view of Miller. In addition, claims 7 and 8 were rejected under 35 U.S.C. § 103 as being unpatentable over Ogawa in view of Miller and further in view of Maichi. These rejections are respectfully traversed.

Initially, Applicants point out that on page 2 of the Office Action, the Examiner refers to a "Gardwood" reference, but there is no such reference cited. It is believed that the Examiner meant to refer to Ogawa. In addition, in the PTO 892 form attached to the Office Action, the name for U.S. 3,378,704 is listed as Smith et al. However, the name of the '704 patent is actually Miller et al., which name was used by the Examiner on page 2 of the Office Action. Also, the Preliminary Amendment submitted with the filing of the application canceled claim 3 and added new claim 16, both of which do not appear to be recognized by the Examiner in the Office Action.

In the rejection, the Examiner contends that Ogawa teaches insulation between the upper and lower piezo-electrically active areas. However, it is respectfully submitted that Ogawa does not teach an intermediate insulating layer disposed between two piezo-electric active layers. Instead, Ogawa merely teaches a multi-layered piezo-electric active layer that includes electrodes coated onto ceramic green sheets. The Ogawa member 31 is similar to Applicants layers 5 and 7. There is no teaching in Ogawa of stacking two or more of layers 31 with an intermediate insulating layer disposed between the layers.

The Examiner admits that Ogawa does not show insulating layers on the top and the bottom surfaces of member 31, but cites Miller as teaching exterior insulating layers. However, the Examiner also alleges that Miller teaches an interior insulating layer, formed from a piezo-electrically inactive material. Moreover, the Examiner alleges that Miller teaches piezo-electrically active and inactive layers sintered integrally in order to protect from flashover and cracking of the structure. It is respectfully submitted that Miller does not teach an interior insulating layer between upper and lower piezo-electric active layers. Moreover, Miller does not teach piezo-electric active layers, an intermediate layer, and surface insulating layers made of the same material as one another and integrated with one another by sintering as recited in claim 1.

There is no disclosure in Figures 5 and 8 of Miller et al. of an interior insulating layer. Figures 5 and 8 are described as having stack films. However, Miller et al. only teaches an insulating cover film on the top and bottom of the stack. There is no teaching of an interior insulating film between layers of the stacks.

Miller et al. discloses a structure having three terminals with respect of the alignment of terminals on a piezoelectric transducer. In this structure, there is no electric insulation for the piezoelectric active layers, and it is difficult to perform the polarization process on each of the piezoelectric active layer at the same time. Therefore, this structure is equivalent to the conventional art. In contrast, the present invention has an intermediate insulating layer for securing high reliability and keeping production costs down.

Therefore, the hypothetical combination of Ogawa and Miller et al. does not teach or suggest a piezoelectric ceramic transducer as recited in claim 1. Thus, it is respectfully submitted that claims 1, 2, 4, 5, 9, 10 and 12 are allowable over the cited references.

Furthermore, Maichi does not overcome the deficiencies of Ogawa and Miller et al. The structure described in Maichi is of the type in which the electrode and the ceramic plate are alternately stacked and in which the vibration occurs in the bending mode. However, Maichi discloses a structure in which the electrode and the ceramic plate are alternately stacked by pasting them with an elastic body. The structure described in Maichi is similar to the related art described in the specification of the present invention. Therefore, Maichi only describes problems in the related art which are solved in the present invention by the configuration of the electric terminal, the polarized structure, and the configuration of the intermediate insulation layer. Thus, the hypothetical combination of Ogawa, Miller et al. and Maichi do not teach or suggest the invention as recited in claims 7 and 8.

It should be understood that due to the polarization process, the polarization directions of a plurality of piezoelectric active layers are different from each other. Due

to the intermediate insulating layer, which is arranged between each of the piezoelectric active layers having different polarization directions, the polarization process of each of the piezoelectric layers can be performed at the same time as the insulating properties are made, and this leads to manufacturing cost reductions.

In general, a piezoelectric transforming device, which generates a bending movement, is comprised of two piezoelectric ceramic elements having an electrode and a constant modulus body such as resin or metal. In this structure, a constant modulus is placed between two piezoelectric ceramic elements.

In contrast, the piezoelectric ceramic transducer in the present invention is characterized in that a bending movement can be done "without using the constant modulus body". The reason why a constant modulus body is not necessary, is that a plurality of piezoelectric active layers, which are arranged above and below and which cause different displacement movements to each other due to the structure of the polarization and due to the method of driving, work different movements to each other. Because of this, the piezoelectric ceramic transducer in the present invention achieves the bending displacement. This structure is applied to claim 1.

Additionally, the piezoelectric ceramic transducer in the present invention can be sintered at one time and can be integrated, so the piezoelectric ceramic transducer is made only of the materials of piezoelectric ceramic and electrode (layer).

In addition, some commonly-used oscillator uses thick metal plate for the constant modulus body, and this constant modulus body is used at the same time for the electrode by making adhesive joining with the piezoelectric element. However, the "electrode" in the present invention is used for driving the piezoelectric active layer, and this electrode

is different from the constant modulus which is generally used. Thus, in the present invention, the piezoelectric ceramic plate and electrodes are sintered at one time and are integrated, and after the piezoelectric is sintered, it is not necessary to form electrodes and to join the piezoelectric element by using an adhesive agent.

The electrode is provided for driving the piezoelectric active layer, and the electrode (piezoelectric active layer 5) is covered by the insulating layer because the electrode was placed on the piezoelectric active layer and because upper end of the piezoelectric active layer was covered by the insulating layer which is the same material. The electrical separation is created by formation of piezoelectric active layer and insulation layer. Electric terminals for the electrode are coated by the insulating layer. As a result, the electrode is protected from humidity and the electrode will not become damaged.

Thus, the invention as recited in claim 1 has a significant advantage over the cited prior art, alone or in any proper combination thereof.

Moreover, the present invention has the electric structure in which the polarization of the active layer is processed "at a time" by using "four electrodes" which are mounted on the surface of the piezoelectric transducer, and after the polarization process, the (internal) electrode, which is placed on the active layer, and the electrode terminal, which is mounted on the surface of the piezoelectric transducer, are wire-connected, and finally, the piezoelectric transducer is driven by two electrode terminals which were mounted on the surface. Therefore, claims 2 and 4-16 are allowable over the cited prior art.

In view of the above, it is respectfully submitted that all of the claims in the application contain patentable subject matter and a Notice of Allowance is respectfully solicited.

Respectfully submitted,

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